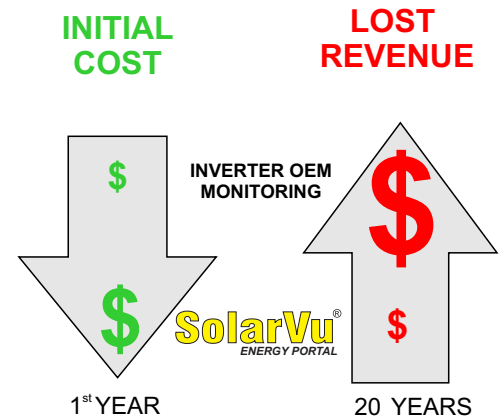


Solar PV Portfolio Owner

What Management Solution Should I Buy ?

Options - Total Cost

- No monitoring
- Inverter manufacturer portal
- SolarVu equipment portals/enterprise
- Asset management software



A comprehensive monitoring system offsets its initial cost by minimizing downtime with effective O&M and reporting

Show me the money !

- Minimize downtime = maximize energy revenue
- Reduce O&M costs, faster fault notification
- Meet LDC compliance requirements
- Verify correct LDC payments
- Performance analysis & financial reports

Energy Portal Selection Considerations

- Product benefits & features
- Single interface for many brands of equipment
- Initial & ongoing cost
- Vendor competence & reputation
- Vendor support
- Future expansion flexibility

Example 20MW Portfolio of 100 sites at 200kW ea
 65,000 panels
 5,400 strings
 800 25kW inverters

REVENUE LOSS FROM FAULTY EQUIPMENT

(FIT2=\$0.64/kWh)

1 String 4,500kWh/yr = **\$2,500/yr**
 25kW inverter 31MWh/yr = **\$18,000/yr = \$1,500/mo**
 200kW site shut down 1,200kWh/summer day = **\$760/day**

Solar PV Management Issues

STUFF HAPPENS

COMMISSIONING

- Incorrect comms settings in inverters and BOS devices
- Serial wiring errors by electrician
- Meter CT/PT wiring errors/settings
- Router network settings
- Weak 3G cellular reception
- Wrong/missing equipment data supplied

EQUIPMENT FAILURE

- Inverter failure
- Solar panels fail
- Corroded connections
- Loose connection = overheating, fire hazard
- Equipment left off after maintenance
- BOS equipment failure weather sensors, meter, SCADA etc

ENVIRONMENT

- Combiner box water ingress
- Rodent chews through panel wires
- Lightning damages equipment
- Grid issues cause shutdown - under/over voltage
- Snow cover / dirt buildup

COMMUNICATIONS

- Loss of internet connection
 - Router/network configuration
 - Customer changes router settings
 - Router/ network failure
 - 3G SIM card disconnected non-payment
 - Weak reception in rural areas
- Equipment loss of communications
 - Faulty connection
 - Incorrect settings after replacement
 - Noisy environment, data corruption
 - Inverter design - firmware bugs

GETTING PAID

- Utility payment below expected - meter fault / accounting
- LDC SCADA problem = shutdown by LDC
- RMA for warranty claim - support data

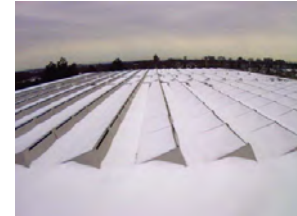
Panels



Inverters



Harsh Environment



Collateral damage



Combiners



SCADA & BOS equipment



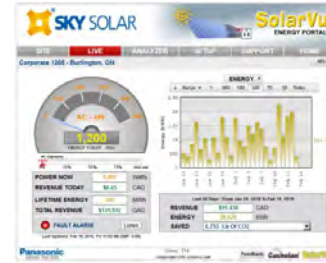
Managing A Large Distributed Portfolio

Portfolio Summary for owner, O&M, investors

Status	Number	Run Time	Savings CIGS lb	Output Schedule	Size kWac	Sell Energy	Sell Rate	Sell Revenue
Total	18		42,412 lb		4,560 kW	179,795 kWh		\$ 96,956
1	Queen St # 835	186 Days	2,193 lb	47 %	220 kW	9,297 kWh	\$ 0.54	\$ 5,011
2	62 Selby	1.0 Years	4,615 lb	43 %	500 kW	19,565 kWh	\$ 0.54	\$ 10,546
3	Craig 29	265 Days	2,010 lb	61 %	150 kW	8,520 kWh	\$ 0.54	\$ 4,592
4	Equestrian 931	263 Days	2,710 lb	50 %	250 kW	11,489 kWh	\$ 0.54	\$ 6,193
5	Stanfield 2562	224 Days	5,168 lb	60 %	400 kW	21,907 kWh	\$ 0.54	\$ 11,808
6	Corporate 1205	256 Days	6,753 lb	62 %	500 kW	28,028 kWh	\$ 0.54	\$ 15,430
7	Atherley 130	155 Days	713 lb	20 %	160 kW	3,021 kWh	\$ 0.54	\$ 1,628
8	Queensway 443	172 Days	1,671 lb	31 %	250 kW	7,095 kWh	\$ 0.54	\$ 3,819
9	640 Rosetree Dairy	316 Days	2,414 lb	45 %	250 kW	10,235 kWh	\$ 0.54	\$ 5,527
10	Trowers 164	252 Days	518 lb	48 %	50.0 kW	2,196 kWh	\$ 0.55	\$ 1,203
11	Passmore 328	225 Days	2,605 lb	48 %	250 kW	11,045 kWh	\$ 0.54	\$ 5,963
12	West Beaver Creek # 135	268 Days	1,846 lb	43 %	200 kW	7,824 kWh	\$ 0.54	\$ 4,217
13	Emblem 50	206 Days	2,297 lb	39 %	300 kW	9,738 kWh	\$ 0.54	\$ 5,249
14	Bental #60	186 Days	1,806 lb	56 %	150 kW	7,656 kWh	\$ 0.54	\$ 4,127
15	50 McCleary	310 Days	2,029 lb	47 %	200 kW	8,603 kWh	\$ 0.54	\$ 4,617
16	420 Passmore	319 Days	1,242 lb	28 %	200 kW	5,206 kWh	\$ 0.54	\$ 2,830
17	651 Harwood	350 Days	1,391 lb	13 %	500 kW	5,898 kWh	\$ 0.54	\$ 3,179
18	Fina 37	252 Days	429 lb	66 %	30.0 kW	1,819 kWh	\$ 0.55	\$ 997

Detailed screens by site

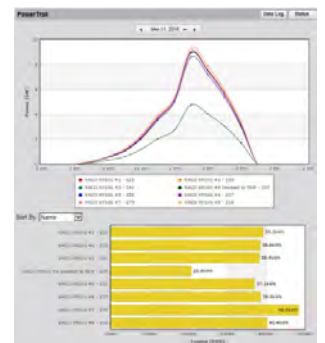
Live & lifetime energy/revenue



Equipment status & logs

Portfolio performance reports

Troubleshooting tools



SolarVu SMART Enterprise Benefits

- ✓ Portfolio alarm status
- ✓ Diagnostic tools
- ✓ Reduce routine checks
- ✓ One GUI for mixed vendors
- ✓ One login for all sites
- ✓ Print custom reports
- ✓ View / download
- ✓ Online document retrieval
- ✓ Download data for analysis
- ✓ Free to SolarVu owners

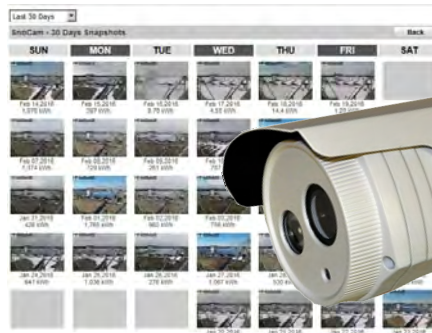
Email performance reports & alarm notifications



SolarVu gateway enclosure



Site conditions



LDC SCADA monitor/control



Energy Portal Requirements

SolarVu portals address these issues

✓ COMMISSIONING

- Debug wiring, network, comms settings, equipment settings
- Prove all devices 100% working before signoff & payment
- Performance meets specs, monitor after initial installation
- LDC SCADA testing & signoff for connection permission

✓ O&M OPERATIONS & MAINTENANCE

- Alarms - immediate email faults, abnormal conditions eg sun low power, equipment faults
- Live status, Enterprise view of faults - navigate to site for details, by exception
- Understand problem before dispatch to minimize site labour & visits. Bring correct spares
- Diagnostic Tools for O&M service provider

- Live inverter/meter values,

- Equipment logs text and data last 30 days - detects intermittent problems

- Internet communication live status and 30 day reception log

- String level monitoring

- Compare inverters to detect bad strings, performance problems

- Best days - prove system achieves design capacity

- Local weather conditions, panel snow cover, roof conditions (cameras)

Communications

- LAN network, setup settings, dropout

- 3G cellular SIM setup, antenna rural reception, bill management, renewals

Notification

- Email status and alarms with cause of fault, location, link to diagnostic screen

- Alarm indicators on screens

- Single user interface for all equipment now and in future

- Access anywhere - PC, phone, tablet, multiple locations, no software-browser access

Documents and records

- Online document retrieval, roof layout, manuals, error codes, drawings

- Online help & videos

✓ REPORTING & ANALYSIS

- Live browser view any time period \$, energy, performance, carbon offset

- On demand PDF reports for any time period, required parameters, by all sites or subgroups

- Portfolio financial performance reports

- Human data download for spreadsheet analysis

- API for server data transfer to support Asset Manager Software programs

- Compare to similar sites

✓ PAYMENTS

- Verify utility payment for period is correct. Data to back up claims

- 3G SIM card management, view status, control on/off bill verification

- Equipment failure - data to expedite RMA warranty claim

- O&M provider maintenance records by site

✓ FUTURE EXPANSION

- Additional LDC compliance requirements- inverter control, power output

- New OEM devices - inverters, combiners, power optimizers,

- Storage - monitor, TOU (time of use control)

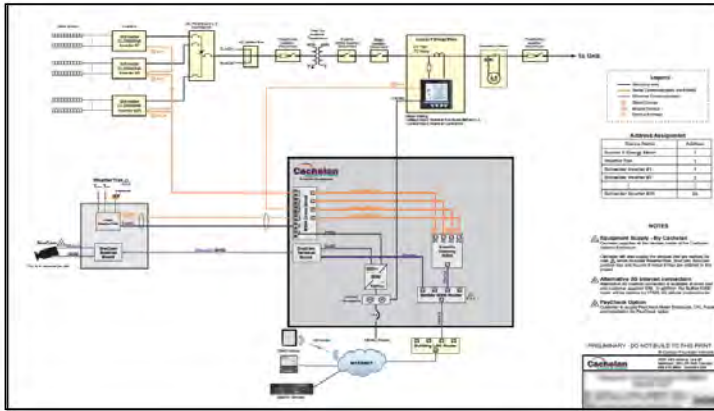
- FIT subsidies replaced by net metering & behind the meter

- EV charge control & metering

Installing SolarVu

For Each Project

Cachelan prepares SLD for communications showing options & connections from system details



Detailed quote for approval based on budget summary

From quote select suitable options for each location

Standard **SolarVu** portal alarms, equipment logs, diagnostics, reports

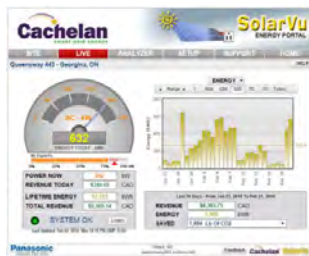
- + **WeatherTrak** irradiance SunLowPower alarm for every inverter
- + **SnoCam** Local weather, roof snow cover
- + **PayCheck** Meter & log to verify utility payments
- + **3G cellular** (if no LAN) + dataplan from Cachelan
- + **LDC SCADA** if required in CIA by LDC, design to spec & commission

Build equipment



Ship to installer

Configure portal



Add to Enterprise account

After Ordering

O&M Support



After commissioning

Reports, alarm alerts, updates

Learn More

Visit cachelan.com

Web pages and Videos describing features

[SolarVu brochure](#)

See live sites that use SolarVu

Installation guides, technical resources

Technical Support

SolarVu® INSTALLATION GUIDES

Inverters -

- AE 35-100TX (PVPowered PVP35-100kW)
- AE 250TX (PVPowered PVP250kW)
- AE 500TX (PVPowered PVP500kW)
- AE 500NX (AE Solaron 500 kW)
- AE 3TL(REFUsol)
- Canadian Solar CSI-23/28/36KTL-CT
- Eaton PV Series
- Fronius IG Plus V(422 Comm Card - IFP)
- Fronius IG Plus V(Modbus Comm Card - DataCom)
- Fronius Symo(DM2 Modbus)
- Kaco Blueplanet
- Kaco XP10U
- Kaco TL3
- Kaco XP100 Series
- Outback Flex, FlexMax, FX, MX, Mate
- PowerOne PV15000/6000/10/12
- Santerno TG NA
- Satcon PG Plus
- Schneider Conext CL18000/25000
- Schneider Xantrex GT5
- Schneider Xantrex GT250
- SMA Sunnyboy Series
- SMA Sunny Tripower TL Series(Speedwire)
- SolarEdge SE Series
- Solectria PVI-3000/4000/5000/5500
- Solectria PVI 10-90K
- Sungrow Central Inverters
- Sungrow SG30/36KU
- Sunergy ELV

Accessories +

BROCHURES

- SolarVu® Energy Portal
- NRGPilot™ SmartGrid Portal
- WebFilm®

VIDEOS

Tutorials -

- SolarVu Tour
- SolarVu SMART Enterprise
- What is SolarVu?
- SolarVu WeatherTrak
- SolarVu Arc Fault Alarm
- SolarVu ANALYZER - Equipment Log
- SolarVu ANALYZER - Smart Strings
- K135 Indicators
- Fronius Installation

Education +

NEWSLETTERS -

- How much money did you make on Family Day?
- Solar PV Reports - 1 2 3 DONE!
- FIT4 Contract or Net Metering
- Its Sunny - Where Are My Watts?
- New Years Resolution - Solar PV
- Carbon Tax Calculator
- MicroGrids
- Monitor DG Storage
- 21st Century Archemedes
- Enterprise - Many Vendors, One Interface
- SolarVu Tour
- Not Your Grampas Weather Station
- Arc Faults
- Needle in a Haystack
- To Shovel or Not to Shovel
- No Jacket Required
- O&M Use the right tools
- Does your CIA require SCADA?
- Stuff Happens
- And the Winner Is
- Winter Blahs
- Show Me the Money

TECHNICAL & HOW TO +

GRAPHICS +